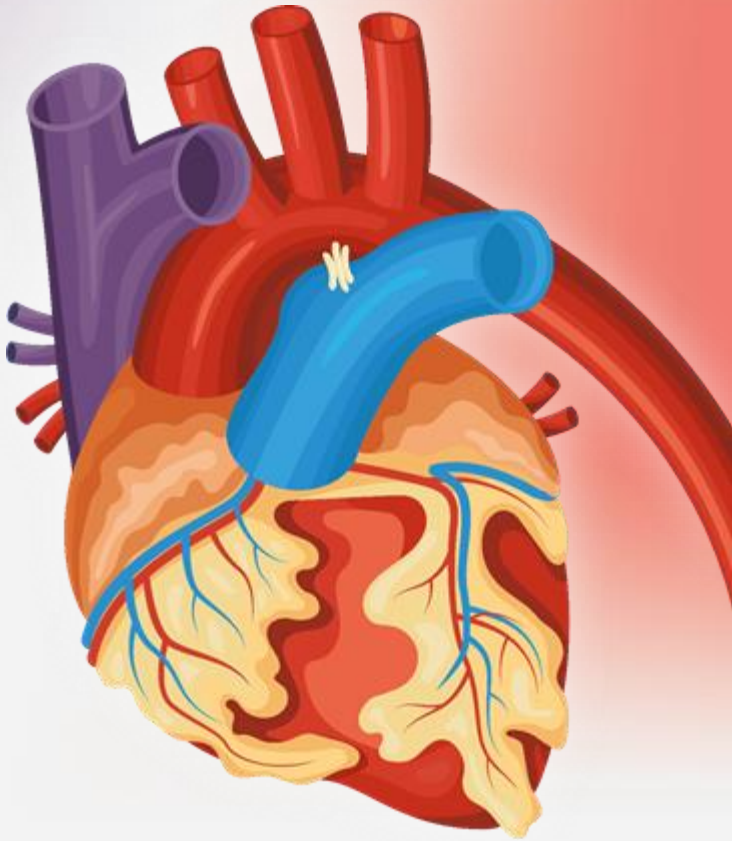
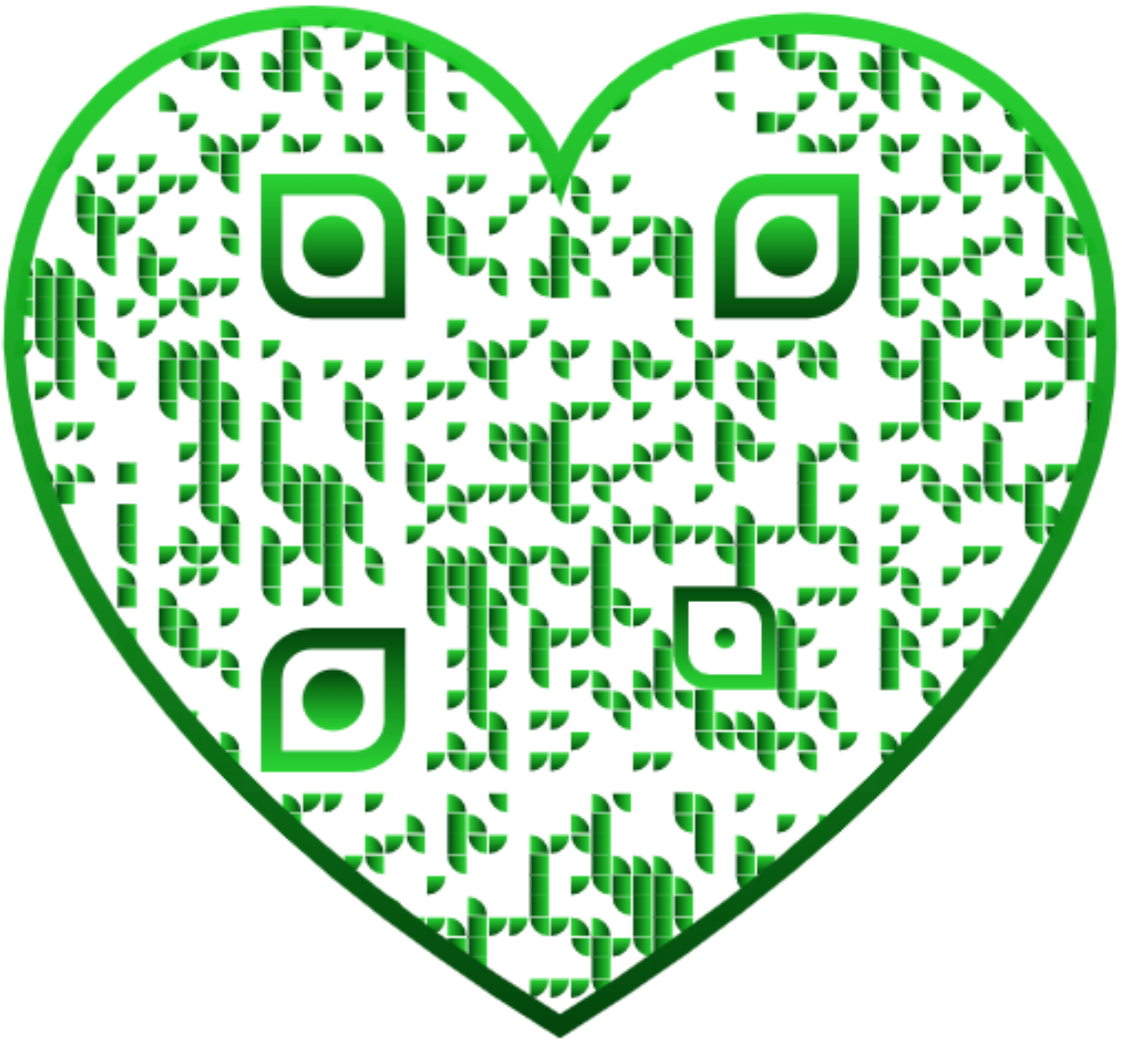
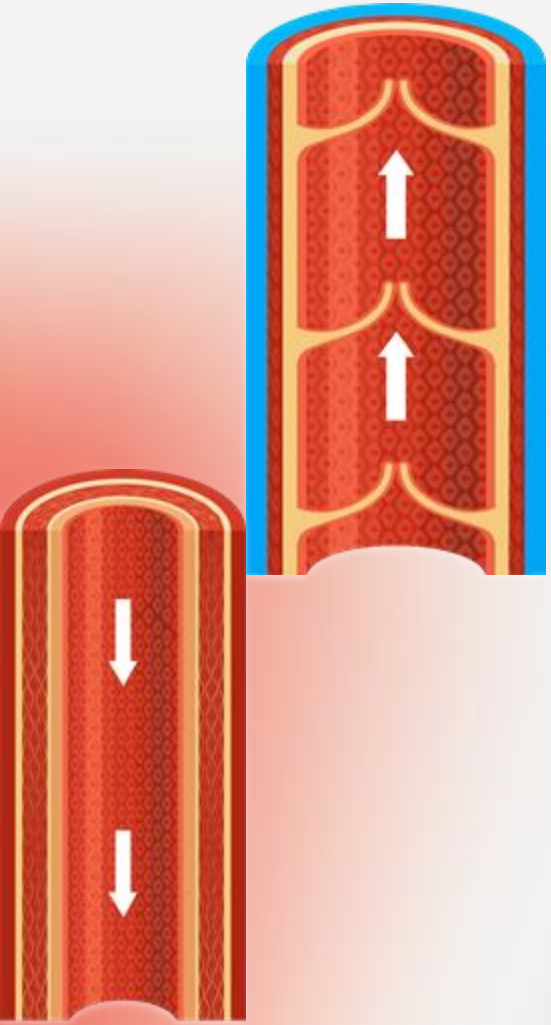
High Blood Pressure.

By. Hadeel Abdullah





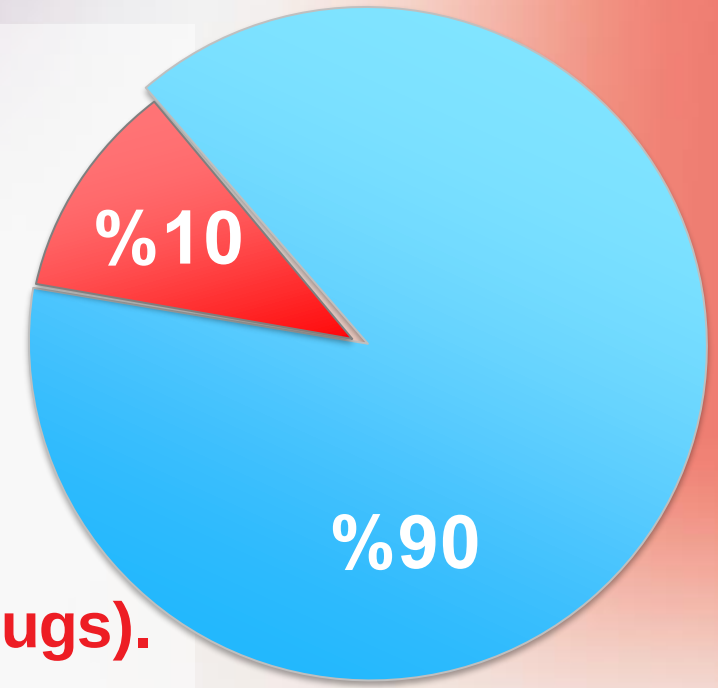


Definition :

HTN is a persistent, nonphysiologic elevation of BP; it is defined as an SBP of 130 mm Hg or greater and/or a DBP of 80 mm Hg or greater.

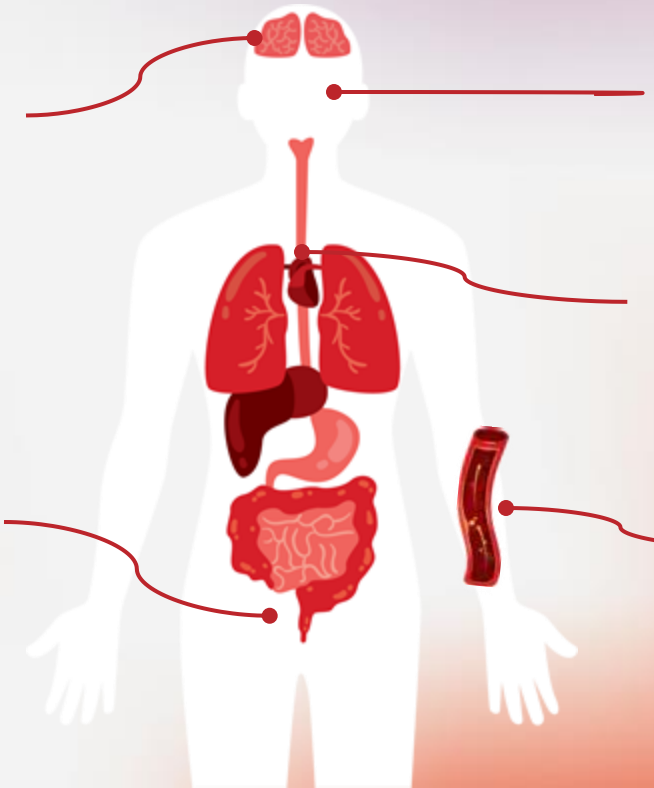
Etiology of HTN :

- **PRIMARY 90% (UNKNOWN)**
- **SECONDARY 10% (Diseases and Drugs).**



Complications of HTN.

Brian hemorrhage and stroke.



hypertensive retinopathy

CVS Problem

Arteries hardness

Renal damage

01

Classification of hypertension .

According to the ESH

Classification of hypertension :

The classification of office BP and definition of hypertension grades also remain the same from previous guidelines (Table 1).

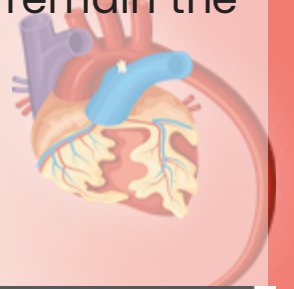


TABLE 1. Classification of office BP and definitions of hypertension grades

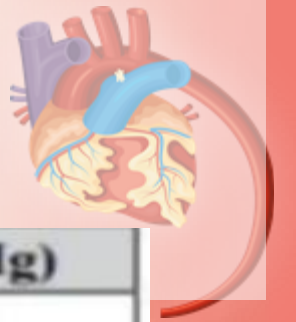
Category	Systolic (mmHg)		Diastolic (mmHg)
Optimal	<120	and	<80
Normal	120–129	and	80–84
High-normal	130–139	and/or	85–89
Grade 1 hypertension	140–159	and/or	90–99
Grade 2 hypertension	160–179	and/or	100–109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension[a]	≥140	and	<90
Isolated diastolic hypertension[a]	<140	and	≥90

02

Classification of hypertension .

According to the ACCP

Classification of hypertension :



BP Classification	SBP (mm Hg)		DBP (mm Hg)
Normal	< 120	*and*	< 80
Elevated	120-129	*and*	< 80
Stage 1 hypertension	130-139	*or*	80-89
Stage 2 hypertension	≥140	*or*	≥ 90
Hypertensive urgency/ emergency	>180	*or*	>120

BP = blood pressure; DBP = diastolic blood pressure; SBP = systolic blood pressure

Antihypertensive drugs and treatment.

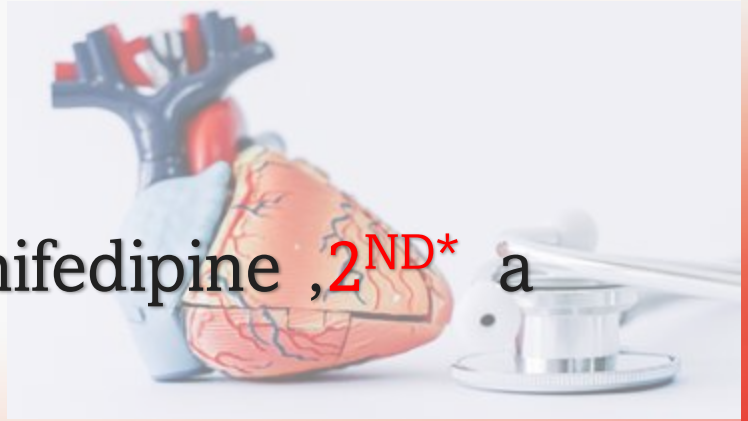
Recommended Lifestyle Modifications

Modification	Recommendation	Approximate SBP Reduction
Weight reduction	Maintain a normal body weight (BMI 18.5–24.9 kg/m^2)	5–20 mm Hg per 10-kg weight loss
Adopt DASH eating plan (includes substantial K intake)	Consume a diet rich in fruits, vegetables, and low-fat dairy products with a reduced content of saturated and total fat	8–14 mm Hg
Reduce Na intake	Reduce Na intake to ≤ 2400 mg/day Reducing Na intake further to ≤ 1500 mg/day is associated with greater blood pressure reduction Reducing Na intake by at least 1000 mg/day will lower blood pressure if desired daily Na intake goal is not achieved	2–8 mm Hg
Physical activity	Engage in regular aerobic physical activity such as brisk walking (at least 30 min/day most days of the week)	4–9 mm Hg
Moderation of alcohol consumption	Limit consumption to: Men: 2 drinks/day (24 oz of beer, 10 oz of wine, or 3 oz of 80-proof whiskey) Women and those of lower body weight: 1 drink/day	2–4 mm Hg

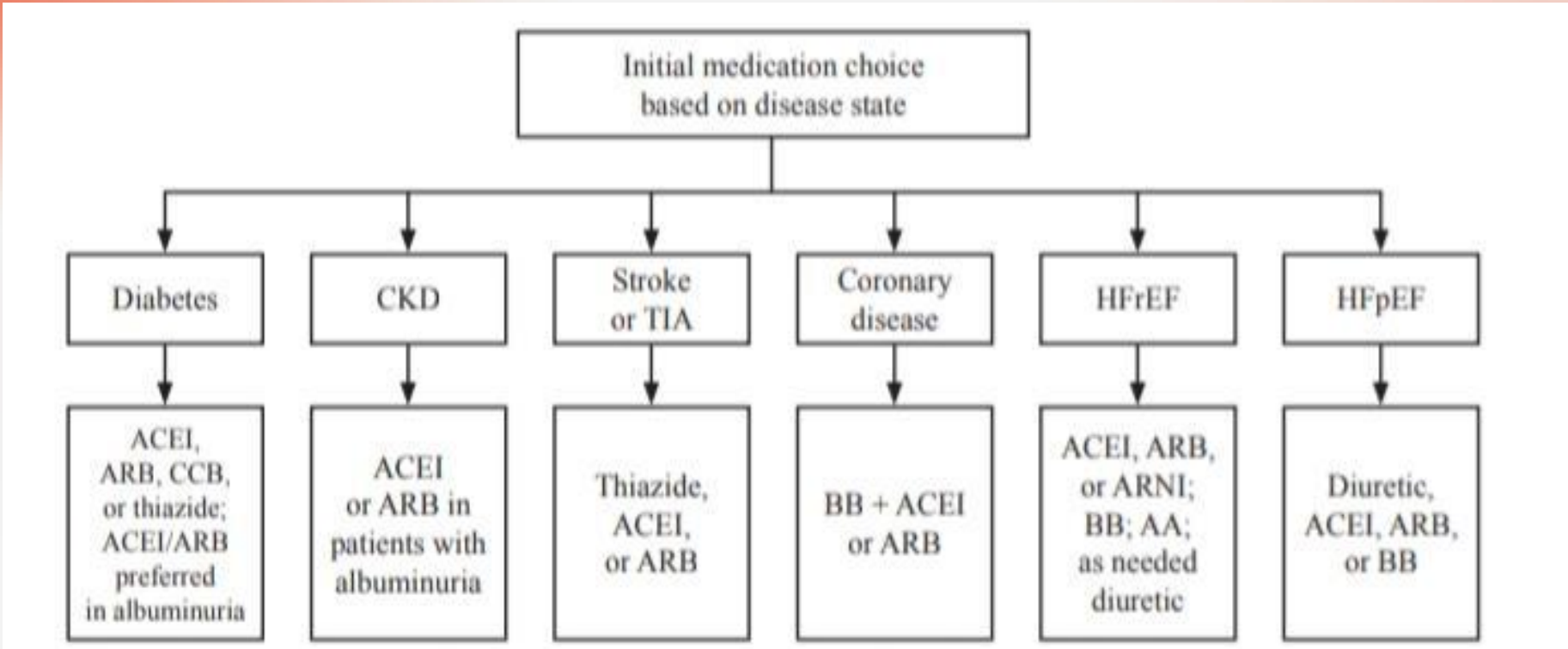
BMI = body mass index; DASH = Dietary Approaches to Stop Hypertension.

Initial drug selection :

- Non black : ACEI or ARBs , Thiazide , CCB.
- Black : Thiazide ,CCB.
- Elderly more >50 years : CCB.
- Pregnant : 1st* Labetalol or ER nifedipine ,2ND* a methyl dopa , Hydralazine.
- In case eclampsia use Mg So4 .



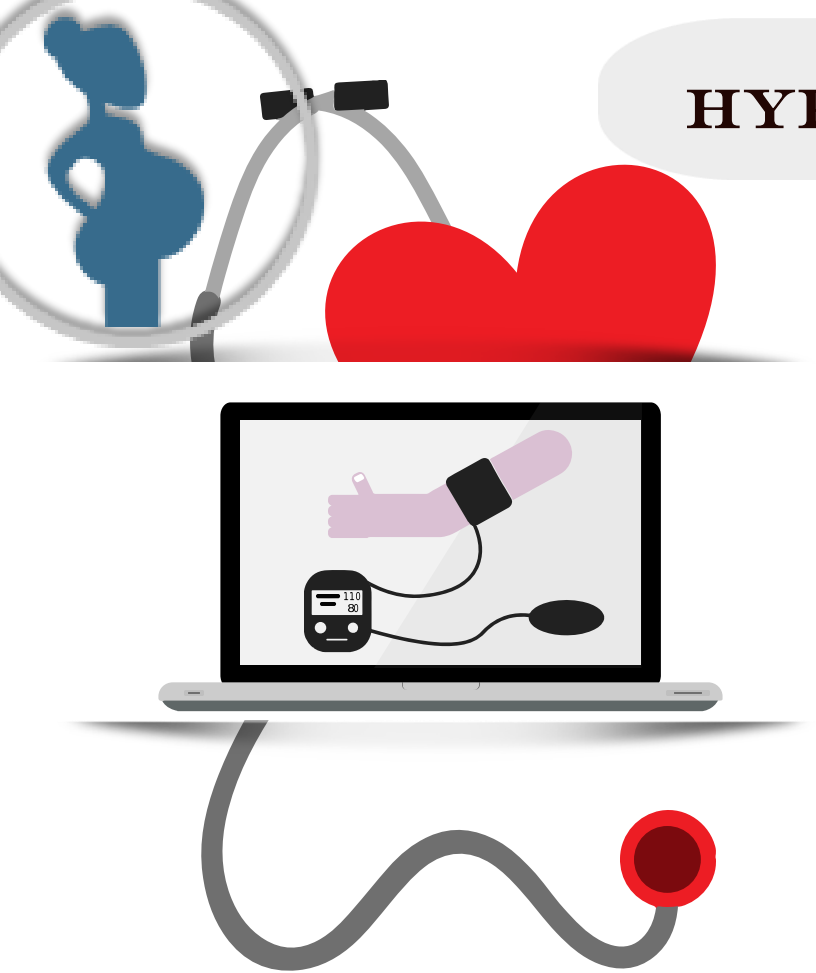
First-line agents for patients with comorbidities


Initial medication choice based on disease state
Diabetes
CKD
Stroke or TIA
Coronary disease
HFrEF
HFpEF
ACEI, ARB, CCB, or thiazide; ACEI/ARB preferred in albuminuria
ACEI or ARB in patients with albuminuria
Thiazide, ACEI, or ARB
BB + ACEI or ARB
ACEI, ARB, or ARNI; BB; AA; as needed diuretic
Diuretic, ACEI, ARB, or BB

Drug types, dose and characteristics for treatment of hypertension emergencies

Drug	Onset of action	Duration of action	Dose	Contraindications	Adverse effects
Esmolol	1 min	10–30 min	0.5–1 mg/kg i.v. bolus; 50–300 µg/kg/min i.v. infusion	Second-degree or third-degree AV block, systolic heart failure, asthma, bradycardia	Bradycardia
Metoprolol	1–2 min	5–8 h	2.5–5 mg i.v. bolus over 2 min; may repeat every 5 min to a maximum dose of 15 mg	Second-degree or third-degree AV block, systolic heart failure, asthma, bradycardia	Bradycardia
Labetalol*	5–10 min	3–6 h	10–20 mg i.v. bolus in 1 min; incremental doses ≥20 mg may be administered i.v. at 10 min intervals (max 80 mg) or 1–3 mg/min i.v. infusion until goal BP is reached	Second-degree or third-degree degree AV block; systolic heart failure, asthma, bradycardia	Bronchoconstriction, fetal bradycardia
Fenoldopam	5–15 min	30–60 min	0.1–0.3 µg/kg/min i.v. infusion, increase every 15 min with 0.1 µg/kg/min increments until goal BP is reached	Caution in glaucoma	
Clevidipine	2 min	10 min	1–2 mg/h i.v. infusion, increase every 2 min with 2 mg/h until goal BP, then titrate by smaller increments every 5–10 min		Headache, reflex tachycardia
Nicardipine	5–15 min	4–6 h	5–15 mg/h i.v. infusion, starting dose 5 mg/h, increase every 15–30 min with 2.5 mg until goal BP; maximum 15 mg/h	Liver failure	Headache, reflex tachycardia
Nitroglycerine	1–5 min	5–10 min	5–200 µg/min i.v. infusion, 5 µg/min increase every 5 min		Headache, reflex tachycardia
Nitroprusside	Immediate	1–3 min	0.3–0.5 µg/kg/min i.v. infusion, increase by 0.5 µg/kg/min every 5 min until goal BP (maximum dose 10 µg/kg/min)	Liver/kidney failure (relative)	Cyanide intoxication
Enalaprilat	5–15 min	4–6 h	0.62–1.25 mg i.v. bolus given over 5 min every 6 h	History of angioedema	
Urapidil	3–5 min	4–6 h	12.5–25 mg i.v. bolus; 5–40 mg/h as continuous infusion		
Clonidine	30 min	4–6 h	0.2–0.5 µg/kg/min i.v.		Sedation, rebound hypertension
Phentolamine	1–2 min	10–30 min	1–5 mg i.v. bolus or continuous i.v. infusion at a rate of 0.5–20 µg/kg/min		Tachyarrhythmia, chest pain

HYPERTENSION IN PREGNANCY

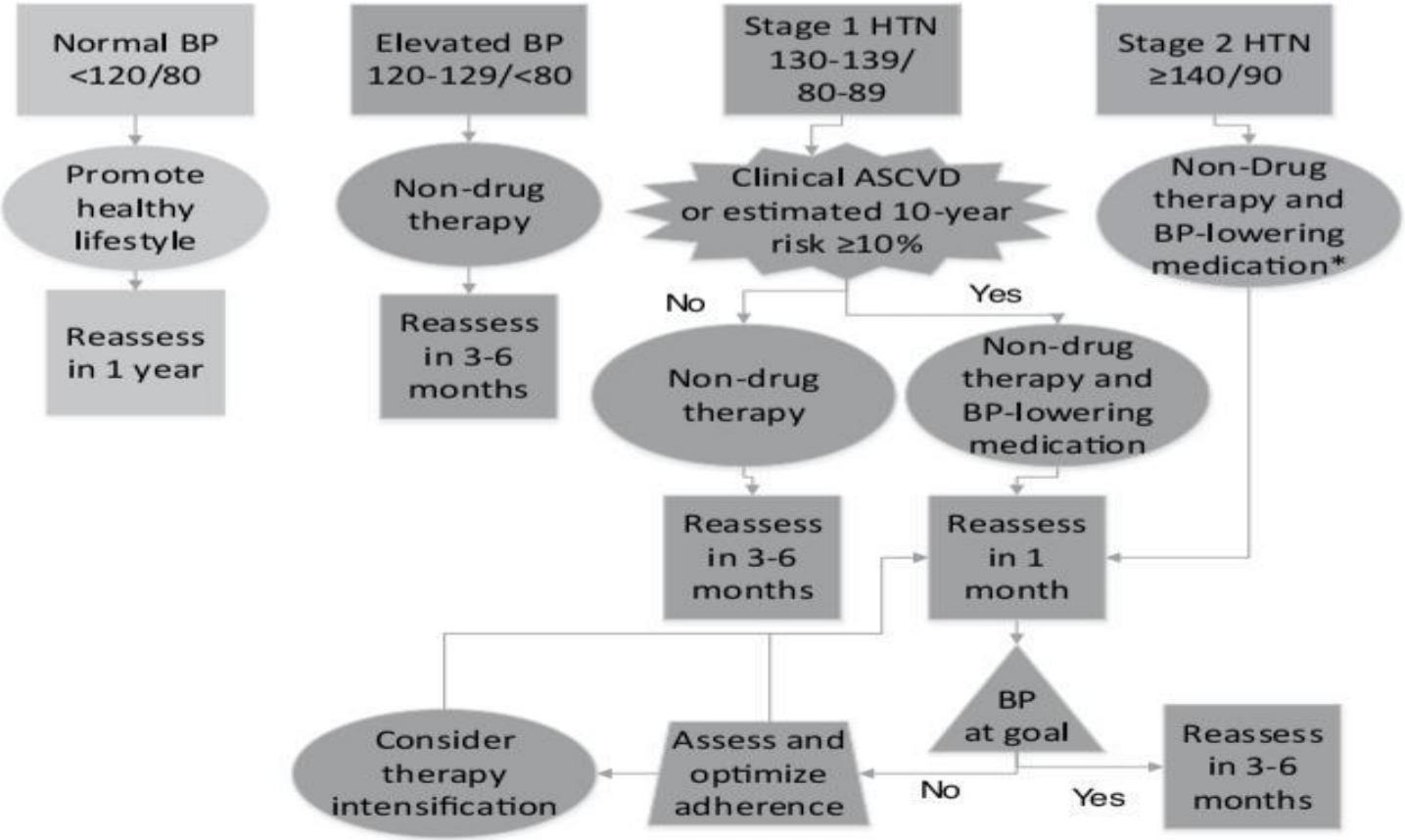


1st* Labetalol or ER nifedipine

2nd* a methyl dopa , Hydralazine.

In case **eclampsia** use **Mg So4 .**

BP treatment strategies according to BP level and ASCVD risk.



01 Blockers of the renin–angiotensin system (RAS)

- **ACEI** Angiotensin-converting-enzyme inhibitors
- **ARB** Angiotensin receptor blockers
- Renin inhibitors

02

Calcium channel blockers

- Dihydropyridine CCBs
- Nondihydropyridine CCBs

03

Diuretics

- Thiazide/ thiazide like
- Potassium _sparing
- Loop diuretics

04 Beta_blocker

05 Alpha-1 blockers

06 Centrally acting drugs

07 Vasodilators

Adverse effect of medicine:

- **ACEI:**

O dry cough

Solve problem by switch to ARBs.

- **ACEI** and **ARBs:**

O hyper K and elevated Scr, Angioedema.

STOP medication and use other agent.

- **CCB:**

O ankle edema

Solve problem by reduce dose of CCB , Minimize salt intake, avoid prolong standing and, use mild dose Diuretic .

- **BB:**

O Peripheral vascular diseases and fatigue

O D.M can Mask hypoglycemia signs.

Solve problem by switch to selective B1 blocker and use pentoxifylline and cilostazol

NB: Anti dote : i.m glucagon.

Diuretic (THIAZIDE)

O Nocturia

Solve problem by take early (no later 4 PM)

NB: if Crcl less 30 ml/min is (C.I).

Diuretic and BB:

O erectile dysfunction in men

Solve problem by use Sildenafil.

Hydralazine:

O Drug induced SLE

STOP medication and use other agent.

V.D Anti-HTN :

O Orthostatic hypotension.

1.Solve problem by Start with small dose at bed time then increase gradually .

2.Take enough fluid.

V.D Sodium nitroprusside

O sever toxicity (cyanide toxicity)

1.Solve problem by give i.v Na thiosulphate or hydroxocobalamin

Antihypertensive Agents frequent, adverse effects and doses

Table 6–7

Commonly Used Oral Antihypertensive Drugs by Pharmacologic Class[2,26,27]

Class	Brand	Usual Dose, Range (mg/day)	Frequency	Select Adverse Events
Diuretics				
Thiazides and thiazide-like	Chlorthalidone (Hygroton)	12.5–25	QDay	Hypokalemia and other electrolyte imbalances Negative effect on glucose and lipids
	Hydrochlorothiazide (Esidrix, HydroDiuril, Microzide, Oretic)	12.5–50	QDay	
	Indapamide (Lozol)	1.25–2.5	QDay	
	Metolazone (Zaroxolyn)	2.5–10	QDay	
Loops	Bumetanide (Bumex)	0.5–2	QDay or BID	Hypokalemia and other electrolyte imbalances
	Furosemide (Lasix)	20–80	BID	
	Torsemide (Demadex)	5–10	QDay	
Potassium-sparing	Amiloride (Midamor)	5–10	QDay or BID	Potassium-sparing diuretics may enhance hyperkalemic effects of drug therapies (eg, ACE inhibitor, aldosterone antagonist)
	Triamterene (Dyrenium)	50–100	QDay or BID	
Aldosterone antagonists	Eplerenone (Inspra)	50–100	QDay or BID	Hyperkalemia
	Spironolactone (Aldactone)	25–100	QDay	Gynecomastia (spironolactone)

β-Blocker				
Cardioselective	Atenolol (Tenormin)	25–100	QDay or BID	Bradycardia
	Bisoprolol (Zebeta)	2.5–10	QDay	Heart block
	Metoprolol tartrate (Lopressor)	100–200	BID	Heart failure Dyspnea, bronchospasm
	Metoprolol succinate (Toprol XL)	50–200	QDay	Fatigue, dizziness, lethargy, depression
Nonselective	Nadolol (Corgard)	40–120	QDay	Hyper-/hypoglycemia, hyperkalemia, hyperlipidemia
	Nebivolol (Bystolic)	5–20	QDay	
	Propranolol (Inderal)	80–160	BID	
	Propranolol long-acting (Inderal LA, InnoPran XL)	80–160	QDay	
	Timolol (Blocadren)	10–40	QDay	
Mixed α- and β-blocker	Carvedilol (Coreg)	12.5–50	BID	
	Carvedilol CR (Coreg CR)	20–80	QDay	
	Labetalol (Trandate)	200–800	BID	
CCB				
Nondihydropyridines	Diltiazem long-acting (Cardizem SR, Cardizem CD, others)	120–360	QDay	Bradycardia, heart block (nondihydropyridines) Constipation (nondihydropyridines) Peripheral edema, headache, flushing
	Verapamil sustained-release (Calan SR, Isoptin SR, Verelan)	120–360	QDay	
Dihydropyridines	Amlodipine (Norvasc)	2.5–10	QDay	Gingival hyperplasia (dihydropyridines) Reflex tachycardia (dihydropyridines)
	Felodipine (Plendil)	2.5–10	QDay	
	Isradipine SR (DynaCirc SR)	5–10	BID	
	Nicardipine SR (Cardene SR)	60–120	BID	
	Nifedipine long-acting (Adalat CC, Procardia XL)	30–90	QDay	
	Nisoldipine (Sular)	17–34	QDay	

ACE inhibitors	Benazepril (Lotensin)	10–40	QDay or BID	Cough
	Captopril (Capoten)	25-150	BID or TID	Hyperkalemia
	Enalapril (Vasotec)	10–40	QDay or BID	Renal insufficiency
	Fosinopril (Monopril)	10–40	QDay	Angioedema
	Lisinopril (Prinivil, Zestril)	10–40	QDay	
	Moexipril (Univasc)	7.5–30	QDay or BID	
	Perindopril (Aceon)	4–16	QDay	
	Quinapril (Accupril)	10–80	QDay or BID	
	Ramipril (Altace)	2.5–10	QDay or BID	
	Trandolapril (Mavik)	1–4	QDay	
ARBs	Azilsartan (Edarbi)	40–80	QDay	Hyperkalemia
	Candesartan (Atacand)	8–32	QDay or BID	Renal function deterioration
	Eprosartan (Teveten)	600–800	QDay or BID	Angioedema
	Irbesartan (Avapro)	150–300	QDay	Hypotension/syncope
	Losartan (Cozaar)	50–100	QDay or BID	
	Olmesartan (Benicar)	20–40	QDay	
	Telmisartan (Micardis)	20–80	QDay	
	Valsartan (Diovan)	80–320	QDay	
Direct renin inhibitors	Aliskiren (Tekturna)	150–300	QDay	Hyperkalemia Hypotension
Central α_2-agonists	Methyldopa (Aldomet)	250–500	BID	Transient sedation initially
	Clonidine oral (Catapres)	0.1–0.8	BID	Hepatotoxicity, hemolytic anemia, peripheral edema (methyldopa)
	Clonidine patch (Catapres TTS)	0.1–0.3	Once weekly	
	Guanfacine (Intuniv)	0.5–2	QDay	Orthostatic hypotension (methyldopa, clonidine) Dry mouth, muscle weakness (clonidine)

Table 6–7

Commonly Used Oral Antihypertensive Drugs by Pharmacologic Class[2,26,27] (*Continued*)

Class	Brand	Usual Dose, Range (mg/day)	Frequency	Select Adverse Events
α_1-Blockers	Doxazosin (Cardura)	1–16	QDay	Syncope, dizziness, palpitations, orthostatic hypotension
	Prazosin (Minipress)	2–20	BID or TID	
	Terazosin (Hytrin)	1–20	QDay or BID	
Direct vasodilator	Isosorbide dinitrate 20 mg and hydralazine 37.5 (BiDil)	20–120/ 37.5–225	TID	Edema, hypertrichosis (minoxidil) Tachycardia
	Hydralazine (Apresoline)	100–200	BID	Lupus-like syndrome (hydralazine)
	Minoxidil (Loniten)	5–100	QDay or BID	
Peripheral sympathetic inhibitors	Reserpine (generic only)	0.05–0.25	QDay	Depression Orthostatic hypotension Nasal congestion, fluid retention, peripheral edema Diarrhea, increased gastric secretion

Considerations with specific antihypertensive agents .

β-Blockers.

- Caution with asthma or severe chronic obstructive pulmonary disease (especially higher doses) because of pulmonary β-receptor blockade, especially with nonselective β-blockers or high-dose selective β-blocker
- Greater risk of developing DM than with an ACE inhibitor, ARB, and CCB; use caution in patients at high risk of DM (e.g., family history, obesity)
- Can mask some signs of hypoglycemia in patients with DM
- Can cause depression

Thiazides.

- Can worsen gout by increasing serum uric acid.
- Not recommended for patients with a CrCl less than 30 mL/minute because of reduced efficacy
- Greater risk of developing DM than with ACE inhibitor, ARB, and CCB; use caution in patients at high risk of DM (e.g., family history, obesity
- Can assist in the management of osteoporosis by preventing urine calcium loss

ACE inhibitors and ARBs.

- Contraindicated in pregnancy
- Contraindicated with bilateral renal artery stenosis
- Monitor K closely, especially if renal impairment exists or another K-sparing drug or K supplement is used

Direct renin antagonist (aliskiren)

- Contraindicated in pregnancy
- Contraindicated in patients with DM when used in combination with ACE inhibitors or ARBs because of increased risk of renal impairment, hyperkalemia, and hypotension
- Avoid use in combination with cyclosporine or itraconazole
- Avoid concurrent use with ACE inhibitors or ARBs in patients with renal impairment (CrCl less than 60 mL/minute).

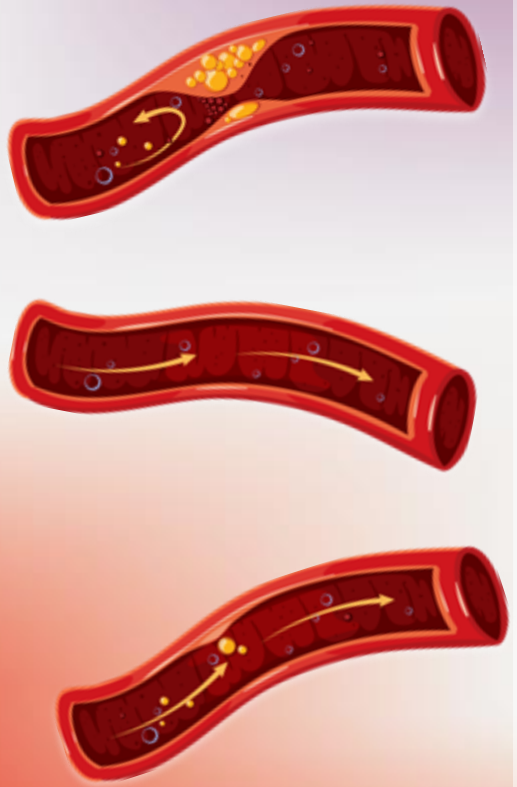
Calcium channel blockers.

Dihydropyridine CCBs

(a) Amlodipine, felodipine, nifedipine
(b) Monitor for peripheral edema, reflex tachycardia, and orthostatic hypotension
(c) Useful for isolated systolic hypertension or use in African American patients

Nondihydropyridine CCBs

(a) Diltiazem, verapamil
(b) Indicated in hypertensive patients with comorbid conditions which would benefit from HR reduction (e.g., atrial fibrillation, stable angina)
(c) Contraindicated in heartblock and sick sinus syndrome
(d) Potential drug interactions due to CYP450 inhibition



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